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RECENT GEOGRAPHICAL CONFERENCES IN THE SOVIET UNION

- USSR -

by D. A. Liliyenberg
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[The following is a translation of three articles written by the authors identified below in Izvestiya Akademii Nauk SSSR - Seriya Geograficheskaya (News of the Academy of Sciences USSR -- Geographic Series), No 5, Moscow, Sep-Oct 1958, pages 134-136, 136-139, and 130-134.]

Interdepartmental Conference on Glaciation of the Caucasus

by D. A. Liliyenberg

The Interdepartmental Working Conference on the Modern and Ancient Glaciation of the Caucasus, attended by representatives of several scientific institutes and universities, was held from 23 through 25 April 1959 in Moscow..

Several scientific papers were read at the conference.

P. A. Ivan'kov (Moscow Affiliate, Geographical Society of the USSR) read a paper on the preparation of the cadastre on modern glaciers of the Caucasus on the basis of cartometric data. The old catalogue of K. I. Podozerskiy had been prepared on the basis of data from plane table surveys from various years and seasons in the latter part of the 19th Century. The new catalogue has made use of large scale maps prepared on the basis of data from aerial photographic surveys from the postwar period made over a short period of time through the territory of the Caucasus. These data show the simultaneous state of the glaciers, and are distinguished by their high degree of comparability. An analysis of this catalogue shows that during the period from 1890 to 1946, all of the glaciers in the Caucasus have been rapidly retreating. There has been a disintegration of the large glaciers, with a resulting increase in the number of small glaciers. The snow line has risen several dozen meters, especially rapidly in the Eastern Caucasus.

G. K. Tushinskiy (MGU [Moscow State University]) reported on the work done at the El'bruss Glaciological Station of MGU. The staff of the station has worked up new methodological approaches for research and has designed new apparatus. They have prepared detailed maps on a scale of 1:5,000, 1:10,000 and 1:25,000, and have made colored and black-and-white aerial photographic surveys. Detailed

studies have been made of the dynamics of the glaciers, their relationships to young volcanic eruptions, and modern neve processes. On the basis of the observations which have been made, the speaker criticized certain existing quantitative computations for paleogeographic reconstructions which do not take into account the specific characteristics of the real heat and water balance of the glaciers or the role of the drifting of snow in feeding glaciers, etc. Consequently, in the speaker's opinion, the boundaries of the ancient glaciation are frequently exaggerated, since there is no analysis of the tremendous effect exerted on the topography by snow fields which have created pseudo-glacial forms.

The paper read by G. D. Dubinskiy (Khar'kov University) was devoted to the actinometric and microclimatic studies made in 1959-1958 on the glaciers of the Northwest Caucasus (Alibek, Bashkara, Tsey, Karaugom, Gul'). He emphasized the important role of local conditions on the behavior of meteorological factors and the radiation balance. It is the speaker's opinion that these conditions must be taken into account in generalizing data on large regions and paleoclimatic reconstructions.

The remaining papers dealt for the most part with various aspects of the problem of the ancient glaciation and paleogeography of the Caucasus.

Of considerable interest was the paper read by Ye. Ye. Milanovskiy (MGU) concerning the moraine deposits discovered by him on the northern slope of the Central Caucasus (the watersheds of the Chegem, Baksan and Cherek Rivers), which he considers as traces of blanket glaciation in the upper Pliocene (Apsheron).

This is the first indication of possible traces of upper Pliocene glaciation directly within the internal mountainous region of the Caucasus. The river valleys of that same region show the traces of three quaternary glaciations, of which the Middle and Upper Quaternary glaciations are the most clearly defined.

Ye. M. Velikovskaya (MGU) discussed certain general problems of the diagnosis of moraine deposits, and problems of the existence of Upper Pliocene and Middle Quaternary glaciations in the foothills of the Northern Caucasus. The speaker substantiated her hypothesis as to the floodwater origin of the "morainiform" inclusions and of large rock waste in the conglomerate stratum of the Rukhs-Dzuar formation of Northern Osetiya. She considers that the Upper Pliocene glaciation developed only on the territory of the volcanic uplands of the Central Caucasus, and did not extend into the area of the foothills. Flare-ups of

volcanic explosions led to the periodic melting of the ice and the development of gigantic floodwaters. The speaker likewise rejected the moraine origin of the large rock waste on the Russian bench of the Terek River at the city of Ordzhonikidze, and along the lower course of the Gizeldon and the Urukhi. The presence of detritus accumulations and rough rock waste in the alluvia is considered as a special phase of the sedimentation of mountain streams.

The paper read by P. V. Kovalev (Khar'kov University) dealt with problems of the glaciation of the northern slope of the Central Caucasus.

In the case of recent glaciation, sharp differences were observed in the number of stages of retreat in various valleys, and differing rates of retreat of glaciers depending upon local physico-geographic conditions, up to and including "self-destruction."

S. L. Kushev (Institute of Geography, Acad. Sci. USSR) gave a detailed analysis of the development and retreat of recent glaciation in the Central Caucasus, which he calls Bezingiyskiy glaciation. On the basis of terminal moraines on the bottom of the Bezingiyskiy Cherek, and moraine ares on the slopes, he has identified eight large-stage arrestations of the glacier and an additional seven microstages of retreat for the last stages (17th and 18th Centuries).

In his paper, A. V. Kozhevnikov (MGU) dealt with problems of the development of the Teberda and Kuban' valleys in connection with the reconstruction of the ancient glaciation of the Southwestern Caucasus. On the basis of erosion cycles, he distinguishes three Quaternary glaciations and one Upper Pliocene glaciation. As many as 15 large stages were identified for the Upper Quaternary glaciation, on the basis of moraines and benches.

A great deal of interest was aroused at the conference by the paper presented by D. V. Tseretel' (Institute of Geography, Acad. Sci. GSSR) on the modern and ancient glaciation of the southern slope of the Caucasus Major (within the boundaries of Georgia) and on the relationship between the Ice Ages with the transgressions of the Black Sea. It has been established that in the last 60 or 70 years, the modern glaciers of Georgia have been constantly diminished, with brief arrestations, but no cases of shifting [nadviganiye] have been registered. Moraines from three glaciations have been preserved in the valleys of the Rioni, the Inguri, and the Kodori, and on the Lechkhumskiy Ridge. While there is a general synchronization between the Black Sea transgressions and the inter glaciations of the Caucasus,

no precise time correspondence has been established between them.

The paper presented by P. V. Fedorov (Geological Institute, Acad. Sci. USSR) dealt with the special problem of the relationships between the Black Sea benches and the river Benches and glaciations of the Caucasus. From the examples of the valleys of the Shakhe, Mzymta, Gumista, and Kodori, it was observed that the river bench V corresponds to the Chaudinskoy bench of the Black Sea, the river bench IV, to the Drevneevksinskaya, and Uzunlarskaya benches, river bench III to the High Karangatskaya, river bench II, to the Low Karangatskaya; and river bench I, to the New Black Sea Terrace. The Tsedel'dinskaya terminal moraine in the Amtkhol River Valley is correlated with river bench IV and the Uzunlarskaya Sea benches. The speaker emphasized that in the Black Sea, regressions correspond to glaciations, while transgressions correspond to inter glacial periods. A lack of correlation is observed in the development of the fluctuations in the levels of the Black Sea and the Caspian Sea: regressions in the Caspian Sea correspond to transgressions in the Black Sea.

In his paper on Dagestan and contiguous areas of the Northeastern Caucasus, D. A. Liliyenberg (Institute of Geography, Acad. Sci. USSR) noted the absence of moraine deposits for more ancient glaciations than the last, and the extensive occurrence of pseudo-moraine formations. For the last glaciation he distinguishes three to four stages of retreat. The moraines of its maximal phase are associated with the late Khazarskyye marine benches of the Caspian. By the same token, a certain metachronization is observed in the development of the glaciation of the Eastern Caucasus and the Russian Plain.

B. A. Budagov (Institute of Geography, Acad. Sci. AzSSR) discussed the glaciation of the Southeastern terminus of the Caucasus Major within the boundaries of Azerbaydzhan, where he identifies two glaciations: of Middle Apsheron and Khazarsko Khvalynskiy age. Fluvial glacial conglomerates have been preserved from the former, and fresh moraine complexes from the latter. Three stages of retreat have been identified for the last glaciation. The depression of the snow line has been determined at 1,100 to 1,300 meters.

In a joint paper, C. P. Bal'yan (Yerevan University) and N. V. Dumitrashko (Institute of Geography, Acad. Sci. USSR) discussed problems of the ancient glaciation of Armenia, where they assume the existence of three ice ages. The Upper Pliocene-Lower Quaternary glaciation was in the

nature of a blanket and left large traces of conglomerates, which are considered as fluvio-glacial. The Middle Quaternary is also identified primarily on the basis of conglomerate formations and is determined as being of the blanket-valley type. The Upper Quaternary glaciation was of the mountain-valley type, and left the clearest traces. Complex interactions with young vulcanism have been observed for this glaciation.

The theses of papers by B. A. Antonov (Institute of Geography, Acad. Sci. AzSSR) on the glaciation of the southeastern part of the Caucasus Minor, and by I. N. Safronov (Northern Caucasus Geological Administration) on the correlation of glacial forms and river benches of the Northwestern Caucasus were read at the conference, as was a brief report by A. D. Kolbutov (Gidroproyekt) and V. P. Lyubin (Institute of the History of Material Culture, Acad. Sci. USSR) on the results of the excavations in the high-altitude Paleolithic stoyanka [?] of the Kudaro-II Cave along the upper course of the Dzhodzhor'i River (South Osetiya).

The conference took note of the great scientific theoretical importance of the investigations carried out in the Caucasus-Black Sea-Caspian area, which constitute a unique nodus for the solution of many problems of the paleogeography of Southeastern Europe and Western Asia.

Many of those who offered comments (K. K. Markov, G. I. Goretskiy, L. I. Maruashvili, et al.) emphasized the necessity for a broad geographic approach to study of the phase diversity of Quaternary deposits and the history of glaciations in the Caucasus, especially in comparison with the Alps, the Carpathians, the Russian Plain, and Central Asia. A good deal of attention was devoted to the role of the most recent tectonic movements, which have left imprints of individuality both on the development of the topography of the Caucasus as a whole, and on particular parts of that region. It was recommended that in making comparisons with remote geographic regions, heavy emphasis be laid on recording phenomena of retardation, metachronization, and the scale of the development of events of the glacial ages. The time has come to intensify the practical aspect of research, since many phenomena of glaciation are playing an important role in national economic building, prospecting for minerals (auriferous properties of the glacial deposits of Armenia), etc.

Certain differences of view as to the glaciation of the Caucasus came to light in the course of the comments. Thus A. V. Geptner, P. V. Kovalev, S. L. Kushev, and P. V. Fedorov assume the emergence of ancient glaciers in the

foothills zone (Tsebel'da, Northern Osetiye), a view which was not supported by other participants in the conference. The autonomy of the glaciation of the Lower Quaternary is still not sufficiently clear. Problems of the mechanism of the formation of pseudo-glacial deposits provoked considerable discussion.

Certain measures were planned for improving coordination of the work of various institutions in studying the glaciation of the Caucasus. In particular it was decided to hold yearly interdepartmental conferences, with field trips for solving controversial problems in the field. It was proposed that the first such conference be held in 1960 at the El'bruss Station of the MGU.

Problems of the Physical Geography of the Amur Basin at the Third Session of the Joint Scientific Council of the Amur Expedition of the Academy of Sciences USSR and the Heilungking Expedition of the Chinese People's Republic

by V. P. Chichagov

The Third Session of the Joint Soviet-Chinese Scientific Council on the Problem of the Amur River was held from 7 through 12 May, 1959 in Moscow. The results of the comprehensive scientific research work of these two expeditions during the last three years were summarized at this session.

A plenary meeting was held on the first day of the session. The following brief introductory speeches by Academician V. S. Nemchinov and Vice-President of the Acad. Sci. PRC /People's Republic of China/ Chu K'e-cheng, general reports were delivered by S. V. Klopov, chief of the Amur Expedition, and Chu Tsu-fan, chief of the Heilungking Expedition. The following days were devoted to work on a sectional level by the sections of nature study, geology and joint sections on economics, power engineering, and transportation. The following is a brief summary of the papers which were of interest to geographers.

Problems of geomorphology and paleogeography. Prof. Tin Hsi-chic (Ch'ansum Pedagogical University) read a paper on "Geomorphological Problems of the Development of Agriculture in the Chinese Part of the Amur Basin," in which he distinguished three geomorphological regions: 1) the low mountains and medium mountains; 2) the plains and table lands; 3) the Khulunbuirskoye Plateau. On the basis of the general features and differences with respect to the development of agriculture, the first region is divided into sub-

regions: a) the medium and low mountains of the Bol'shoy Khingan; b) the dissected table lands of the Malyy Khingan; c) the low mountains and hills of the Malyy Khingan; d) the mountain ridges of the Eastern Manchurian mountainous country; e) the basalt table lands of the Chanbeyshan'. The second region is divided into: a) the San Chi'ang (part of the Amuro-Ussuriyskaya Plain -- V. Ch.) and b) Sungari-Nunch'iang plains; c) the foothillsy lowlands and table lands of the adjacent parts of the Khingan and Ch'angpeishan. The Khulunbuirskoye Plateau is divided into three sub-regions: the denudation plain, the basalt table lands, the alluvial and lacustrine flatlands, and parts of the valleys of ancient rivers. In conclusion, the speaker gave an economic evaluation of the topography, and described measures to combat erosion, deflation, salt encroachment, drought, freezing, and excess of moisture.

V. V. Nikol'skaya (Institute of Geography, Acad. Sci. USSR), in a paper titled "A Geomorphological Description of the Plains of the Soviet Part of the Amur Basin and the Importance of Topographical Conditions for the Agriculture of the Priamur'ye," divided the plains of the Amur Basin into: 1) those developing under the influence of the Amur (alluvial, lacustrine-alluvial) and 2) those created by other factors: denudational, abraisional, glacial, fluvioglacial-glacial, and structural plains. She emphasized the particular role played in the formation of plains by processes of the over development of lakes, proluvial and deluvial, solifluctional, and eolian processes. Each genetic type of plain has its own special morphological characteristic: for glacial plains, hilliness; for erosional plains, small hillocks; for alluvial and lacustrine alluvial plains, rolling hills and crests; for denudation plains, mesa-chain and rolling-mesa topography is typical. In conclusion she emphasized the zonal peculiarities of the meso- and micro-topography of the plains of the Priamur'ye, and the following were distinguished and evaluated as to their possibilities for agricultural utilization: 1) Southern lacustrine-denudational group of flatlands at the sources of the Amur; 2) the northern denudation-alluvial group of flatlands at the sources of the Amur; 3) the upper Zeyskaya alluvial-glacial group of flatlands; 4) the Amuro-Zeysko-Selemdzhinskaya polygenetic group of flatlands; 5) the Zeysko-Bureinskaya alluvial group of flatlands; 6) the Arkharo-Birobidzhanskaya lacustrine alluvial group of flatlands; 7) the Khabarovsko-Nizhne-Ussuriyskaya lacustrine alluvial group of flatlands; 8) the Khankaysko-Ussuriyskaya lacustrine flatlands; 9) the Nizhne-Amurskaya polygenetic

group of flatlands.

Chang Wen-yu and M. G. Organov (Far Eastern Affiliate of the Siberian Division, Acad. Sci. USSR), in a joint paper with the title, "Basic Features of the Geological Structure of the Eastern Part of the Sungari-Ussuriyskiy Geological Region," stated that the beginning of the formation of the Khunskaya, Kraskinskaya, Artemo-Tavrichanskaya, Sungari-Amurskaya, and other depressions dates from the end of the Cretaceous, and that the definite formation took place in the Eocene. Pliocene eruptions of basalt, which continued until recent centuries of our era, were also important in forming the topography.

Sun Shu and Yu. A. Khodak (SOPS, Acad. Sci. USSR), in a paper titled "Basic Features of the Geological Structure of the Malyy Khingan, Changkuangts'ailin and Wangtaashan," singled out the following as among the most important structures of the region: 1. The Zeysko-Bureinskaya and Sungari-Lyaokhesskaya (Sunliao) depressions (superimposed depressions) formed by weak dislocation in the Mesozoic. The depressions are separated by the upheaval of Malyy Khingan, formed in the Hercynian. In its turn, Sunliao depression is divided by a bench of basement rock into the Tsitsikarskaya and Lyaokhesskaya depressions. Along the southeastern edge of the Khingano-Bureinskiy massif is the Amuro-Sungariyskaya depression, and along the eastern edge of the Vandasshan'skiy massif is the Khankayskaya depression, both formed by thick Meso-Cenozoic sedimentation. On the territory of the ancient massif there are smaller depressions, formed by weak dislocation in the Mesozoic: the Sutaraskaya, Sindunskaya, Poteskaya, Kheganskaya, Shuantien, Voken'skaya, Mutanchiang, etc. 2. Depressions formed by dislocations in Tertiary deposits, which have developed within the area of the above-mentioned depressions. The authors of the paper note depressions of the graven type connecting the Zeysko-Bureinskaya and Sunliao depressions in the region of the northern Sunwu; and the Amuro-Sungariyskaya and Sunliao depressions along the valley of the Sungara at the cut-off between Girin and Chamusu.

Problems of the geography of the soil. In a paper titled, "Geographic-Soil Zoning of the Priamur'ye," Yu. A. Liverovski and L. P. Rubtsova (Soil Institute, Acad. Sci. USSR) identify the following soil zones: 1) taiga with brown frozen-taiga, brown taiga alluvial-humus soils, peaty soils, and "marey" peaty soils; 2) coniferous-broad-leaved (mixed) forests with brown humus, brown podzolized, brown humus gley, bog-swamp, and swampy "marey" soils; 3) broad-leaved forests and prairies with brown humus, boggy, and swampy

soils; 4) steppes, with boggy, chernozemoform, bog chernozem, bog-swampy, and boggy salt marsh soils. The paper gave a description of the topsoil in its geographic aspect, in accordance with the peculiarities of the topography, climate, and vegetation. The peculiarities of the soil formation were described in detail, as were the land reserves; and recommendations for their use were made.

In a paper titled "The Soils of the Amur Basin and their Agricultural Reclamation," Sun Ta-tsuan (Institute of Forestry and Soils, Acad. Sci. PRC) reported on the results of three years of surveys on the Soviet and Chinese territories. He emphasized a description of the genetic properties and distribution patterns of the most important types of soil; Brown humus and boggy dark soils. Also, he gave the results of studying the micro-elements and colloidal minerals in the soils of the Priamur'ye. In addition, he discussed the further development of agriculture in the northeastern part of China.

Ch'ang Po-jung (Institute of Forestry and Soils, Acad. Sci. PRC), V. V. Yegorov, and V. S. Muratova (Soil Institute, Acad. Sci. USSR) presented a paper on "The Soda-Salt Encroachment of the Soils of the Minni-Sungariyskaya Lowlands," in which they reported the discovery of centers of salt formation in the region of An'da Station and the villages of Wanju and Chembal, and in the extreme southwest of the lowlands. The centers of salt formation are associated with Tertiary or Lower Quaternary lacustrine-alluvial bottom lands, and are controlled by deeply submerged broad anticlines which show promise of being petroliferous. The authors also made agrotechnical and soil-melioration recommendations, and cited experiences in combatting the soda-salt encroachment of the soils in the lowlands.

G. I. Ivanov (DVF SO, Acad. Sci. USSR) read a paper on "The Soils of the Prikhankayskaya Flatland and the Ussuri Valley: Their Reclamation and Use," in which he distinguished: 1) the brown, podzolized unique soils of the high benches of Lake Khanka and the Ussuri River, frequently called turfy podzolized soils; 2) the bog-type turfy soils of the second bench of Lake Khanka; 3) the meadow-type gley, meadow-type swampy, and swampy soils of the first bench of Lake Khanka; 4) the meadow-type swamp and alluvial soils of the Ussuri River bottom lands.

In a paper on the subject: "The Soils of the Amuro-Zeyskiy Interriverine Area, and the Prospects for Their Reclamation," A. N. Firsov (SOPS, Acad. Sci. USSR) gave a brief description of brown humus podzolized, brown humus gley, bog-swampy, bog swampy humus, and bog-swampy peaty soils.

N. D. Pustovoytov (SOOP, Acad. Sci. USSR) read an interesting paper, "The Meliorative Properties of the Soils of the Primur'ye," in which on the basis of abundant field data he analyzed their water-physical properties, and water and air regimen, and gave a detailed plan for melioration of the soils of the Priamur'ye. The basic meliorative measures included: improvement of the water-physical properties of the soils, and regulating the surface and sub-surface flow.

N. I. Gorbunov (Soil Institute, Acad. Sci. USSR) read a paper titled "The Mineral Composition and Physico-Chemical Properties of the Soils of the Priamur'ye," giving the results of studying the genesis of the highly dispersed minerals in the crust of the wind erosion [sic] of effusive rocks. In analyzing the dust [melkozem] and soils of the eluvia of volcanoes of various ages, the speaker came to the conclusion that the dust formed on the lavas at different rates of speed. "During the first 300 years a layer 1.5 to 1 centimeter thick was formed, and during the next 1,000 years a layer about 30 centimeters thick."

Ye. I. Buzlukova, V. M. Burkova, and A. A. Gorshikova (VSF SO, Acad. Sci. USSR) reported on their experience in "Organizing Soil-Geobotanic Work in the Steppe Zone of the Priamur'ye," and on the results of mobile field station work in the region of Lake Zund-Araltuy, where they make Phenological Observations and studied the dynamics of the productivity of the surface vegetation, the dynamics of the moisture of the soils, and the microclimate.

Problems of the geography of vegetation. Chu Tse-fang (Institute of Forestry and Soils, Acad. Sci. PRC) read a paper on "The Results of Studying the Forests of Bol'shoi Khingan," giving a description of the timber reserves and the economic indexes for their utilization, along with recommendations for selecting methods of felling trees and reforestation. The main trend in forestry management is "simultaneous lumbering operations and reforestation, with intensive increase of the productivity of timber per unit of area, and the transformation of Bol'shoi Khingan into a lumber base permanently and constantly supplying the national economy with timber."

V. B. Sochava (Botanical Institute, Acad. Sci. USSR) presented a paper on the subject, "Subdivisions of the Vegetational Covering, and Principles of Preparing a Geobotanical Map (at a scale of 1:1,000,000) for the Amur Basin." The speaker opined that it was preferable to show both existing and indigenous (restored) vegetation. In view of the fact that no standard system has been elaborated

for the subdivision of the vegetational covering, the legend of the proposed maps should be prepared with a view to the biogeographic peculiarities of the Amur Basin. In this connection the speaker distinguished three types of geographic environment, each with a special combination of vegetative formations: 1) the vegetation of the flatlands and plateaux; 2) the vegetation of the low mountains and the medium mountains; 3) the Gault and Sub-Gault vegetation. In conclusion, she gave a systematized list for the subdivision of the blanket of vegetation of the Soviet part of the Amur Basin. Out of 83 subdivisions, 50 belong to the vegetation of the flatlands and plateaux, 26 to the low mountain and medium mountain regions, and seven to the Gault and Sub-Gault vegetation.

V. Ya. Koldanov (Institute of Forestry, Acad. Sci. USSR) read a paper on "The Principles, Technical Conditions, and Organization of the Joint Work of Soviet and Chinese Forestry Scientists in Preparing a Map of the Forests of the Amur Basin." He stated, inter alia: "The map should reflect the geographic distribution of the forests as a basic factor in the geographic topography of the territory of the Amur Basin, in terms of varieties of trees constituting the forests."

V. A. Rozenberg and Yu. A. Man'ko (LWF SO, Acad. Sci. SUUR) contributed a paper (read by G. E. Kurentsova) titled, "The Spruce-Fir Forests of the Right Bank of the Priamur'ye and the Northern Part of the Sikhote-Alin'," in which they described: 1) high-altitude fir groves with kamennaya [stone?] birch and undergrowth consisting of *Pinus Pumila* and *Rhododendron aureum*; 2) mountainous fir groves, subdivided by the authors into those with undergrowth consisting of brush and moss, thick verdure, ferns, brush and various grasses, and nemoral'nyye [?] groves, 3) valley fir groves, with undergrowth consisting of grass, grasses and moss, and brush plus various varieties of grass.

The papers provoked lively discussions. V. B. Sochava showed that it is of basic importance to prepare a map with comprehensive physico-geographic zoning of the Amur Basin, and that all components should be fully evaluated in its preparation. A map of this kind is indispensable for taking account of natural factors in the distribution of both agriculture and industry. Moreover, V. B. Sochava expressed the opinion that the Zeye-Bureinskaya and Prikhanskaya flatlands represent, not forest-and-steep regions, but provinces of a zone of broad-leaved forests. The steppe groupings of the Far East develop in areas formerly covered by forests. They represent a stage in the development of

vegetation on old waste lands, burned-out areas, wind-eroded slopes, etc. All of the steppe flora and fauna (especially insects) encountered in the Amur Basin are characteristic of oak forests which have been transformed into steppes [ostepennyye dubravy]. In the areas where the trees have disappeared, they form short-lived steppe-type biocoenoses.

Sun Ta-tsuan supported V. B. Sochava's view as to the preparation of a comprehensive physico-geographical map of the Amur Basin.

G. Ye. Kurentsova (DVF SO, Acad. Sci. USSR) noted that in addition to the unique geomorphological conditions, climatic peculiarities -- especially the dry winds of eastern Mongolia and the uneven precipitation -- have been responsible for forming the existing forest-and-steppe regions of the Prikhankayskaya flatlands. The proven absence of turf-podzolized soils in this area also points to a forest-and-steppe landscape of long date, and the absence of broad-leaved forests. The process by which the Prikhankayskaya flatlands were transformed into a steppe region was not due to the activity of man, but is relictual. At the same time, the steppes apparently had a great orcal ?.

Yu. A. Liverovski was of the opinion that the territory which V. B. Sochava classified as a secondary woodless region has unique boggy chernozem soils the analysis of whose organico-mineral compounds (and especially the analysis of the humic acids studied by Khan) sharply distinguishes them from turf-podzolized soils. The indigenous vegetation of the flatlands is of the forest-and-steppe type.

V. V. Nikol'skaya, while she appraised highly the Marxist approach to evaluating the role of the popular masses in transforming the landscape of China and the abundance of scientific data in the paper read by Ting Hsi-chih, noted that the criteria he employed in distinguishing geomorphological regions were untenable. Supporting the views of L. S. Berg on the physico-geographic unity of geographic zones, she considers that the forest-and-steppe flatlands of the Priamur'ye are the indigenous landscape. In addition to soil, geobotanical, and paleogeographical peculiarities, in the Russian Plain. V. V. Nikol'skaya proposed that this concept be expanded with respect to the landscape of the trade wind province of the Amur Basin. V. B. Sochava considers the southern flatlands of the Amur Basin to be special trade wind province of the zone of broad-leaved forests; but in the opinion of V. V. Nikol'skaya, they should be considered as a special forest-and-steppe region of the trade winds.

Ting Hsi-chih stated his belief that the Amur Basin

should be zoned for branches of industry, with special attention to geomorphological zoning.

A. I. Kurentsov (DVF SO, Acad. Sci. USSR) supported V. B. Sochava's views as to the necessity of preparing a comprehensive topographical map, and the usefulness of indicating indigenous vegetation thereon.

In concluding the discussion, V. B. Sochava stated in answer to G. E. Kurentsova and Yu. A. Liverovskiy that in order to prove the fact that any of the physico-geographic phases of the Amur Basin originally had a steppe character, it would be necessary to explain why forests cannot exist there. So far there has been no proof that trees cannot resist the winds in the Primor'ye. The ecological significance of the analysis of the humic acids mentioned by Yu. A. Liverovskiy has by no means been clarified.

A final plenary meeting at which the results of the session were summarized, was held on 12 May. A plan for further Soviet-Chinese investigations was approved. As was noted by Chu K'e-cheng, vice president of the Acad. Sci. PRC, the session did its work "in an atmosphere of friendship and international solidarity." The disinterested friendship, mutual assistance, and mutual understanding between the Soviet and Chinese peoples is growing from year to year.

Conference on the Problem, "Heat and Water Regime of the Earth's Surface, Its Role in the Dynamics of Natural Phenomena, and Methods of Transforming it for Practical Purposes."

by A. P. Gol'tsov

An Interdepartmental Conference on the Problem, "The Heat and Water Regime of the Earth's Surface, Its Role in the Dynamics of Natural Phenomena, and Methods of Transforming it for Practical Purposes," organized by the Institute of Geography Acad. Sci. USSR and the Main Geophysical Observatory imeni A. I. Voyeykov, was held from 7 through 11 April 1959 in Leningrad. Scientific workers directly concerned with research in the problems within the framework of the given problem, participated in the work of the conference.

In his opening speech, Academician I. P. Gerasimov stated that the tasks of the conference included, analyzing the present state of the given problem, information on the results of recent research, and determination of means for its further development.

Four papers dealt with problems of studying the heat balance of the earth's surface. M. I. Budyko (GGO Main Geophysical Observatory), in a paper titled "The Heat Balance of the Earth's Surface," provided a general survey of the state of research on the heat balance and the use of the results obtained in solving various scientific and practical problems; for example, the impending problems of adjusting and detailing data on the regime and geographic distribution of the radiation balance, preparing maps of evaporation and turbulent heat exchange on land for individual months. Data on the distribution of the components of the heat balance have already been widely utilized in studying the hydrological regime on land, conditions of the development of the vegetative and soil covering, investigating complex problems of the formation of geographic zones, the genesis of climate, and in prognoses of particular meteorological phenomena, calculating the use of solar energy, providing a basis for meliorative measures, etc.

Yu. D. Yanishevskiy (GGO), in a paper titled "Methods of Actinometric Research," reported on the results of analyzing the accuracy of existing methods of measuring currents of radiation. Improvement of instruments and methods of measurement has made it possible to eliminate substantial systematic errors in measuring components of the radiation and illumination balance. At the present time, even thermoelectric balancometers have a margin of error not exceeding three to five percent. Measurements of the components of the radiation balance are being made throughout a large network of stations. Urgent problems include the further study of the absolute spectral intensities of radiation, extensive investigations of the albedo surfaces, the development of methods for ship-borne actinometry.

In a paper with the title, "Distribution of Solar Radiation over the Earth," T. G. Verlyand (GGO) summarized the results of studying the distribution of mean monthly magnitudes of solar radiation and its components over the earth, gave an analysis of the character of the variability of solar radiation in individual years, the relationships between direct and scattered radiation in the basic climatic zones. Areas of further research include the development of methods of indirect computation of total radiation and its components for short periods of time, and for intersected localities; the preparation of more detailed maps of monthly values and descriptions of the daily behavior of solar radiation; and a study of the non-periodic variability of components of total radiation.

In a paper titled "The State and Tasks of Research on the Heat Balance of Forests," B. L. Dzerdzeyevskiy and

Yu. L. Rauner (Institute of Geography, Acad. Sci. USSR), summarized the results of the first observations made in the USSR on the heat balance above and below the forest canopy. These observations, in addition to a description of other important aspects of the phenomenon, showed the basic importance of direct measurement of the intensity of such an important (and hitherto only slightly studied) process as forest transpiration (the difference between the total evaporation under the forest canopy and evaporation from the soil in the forest). The authors of the paper proposed as a prime task of further research, increasing the number of points for balance observations above the forest canopy; the establishment of ratios with the components of the heat balance of woodless areas; and the geographic generalization of the results obtained for large territories in connection with the extent to which they are covered with forests.

The second group of papers dealt with problems of the water balance. In a paper titled "General Tasks of Research on the Water Balance," G. P. Kalinin (TsIP /Central Weather Institute/) described the state of those problems and tasks of research on the water balance which relate most directly to the general aims of the problem of the heat and water regime as a whole. The speaker emphasized that today the most important tasks are research on the formation of the run-off in accordance with the factors determining it. Since empirical ratios give only an incomplete and indirect picture of the processes, the balance method and experimental studies of elementary processes (seepage, evaporation, snow-melting, etc.) must provide the basis. The study of the formation of the water balance must be made on the basis of a synthesis of these elementary processes, geographically generalized for the territory. Control of the results obtained can be effected by means of comparison with the empirical data on the run-off for the basins. Parallel study of the dynamics of ground water, which at the present time is done separately and cannot facilitate the completion of the water balance, is an urgent task.

In a paper titled "Experimental Research on the Elements of the Water Balance on Land," V. I. Kuznetsov and I. V. Popov (GGI /State Hydrological Institute/) described the existing installations and methods of the network of field experimental laboratories and specialized hydrological stations of the Hydrometeorological Service. It was noted that the research of the Valdayskaya Laboratory covers a territory of 10,000 square kilometers, and is carried on at 35 experimental basins, 23 run-off areas, and five water-

balance areas.

In a paper titled "Methods of Studying the Water Balance," M. I. D'vovich (Institute of Geography, Acad. Sci. USSR) emphasized that the run-off should be studied by means of the comprehensive utilization of data on objectives of varying size: run-off areas and the water-collecting points [vodosbory] of ravines and river basins. With a decrease in the area of the water-collecting point there are greater possibilities for individual study of the factors affecting the run-off; but at the same time this complicates the problem of selecting adequately representative of large territories. In this respect it does not help simply to increase the number of objectives. What is required is a thorough analysis of the conditions, after which a small number of representative objectives will yield more effective results. On the basis of accumulated experience, basic principles for making a water-balance study of run-off were recommended.

A. I. Budagovskiy (Institute of Geography, USSR), reported on the task and methods of impending research on the water balance of the soil, showed that a study of the water balance in the soil is a vital part of the general problem: the water balance of the soil synthesizes the dynamics of the heat and water balances of the earth's surface and determines the conditions for the development of vegetation and soil-forming processes. On the basis of analyzing the components of the water balance in the soil and modern achievements in the hydrology of the soil, the theory of the heat balance, and plant physiology, the speaker indicated means and methods for determining these components and their geographic generalization.

A paper with the title, "Zonal Peculiarities of the Formation of the Spring Run-Off in the European Territory of the USSR," by V. D. Komarov (TsIP), which served as a concrete example of applying the method of the water balance to an analysis of complex geographic phenomena, set forth the patterns of spatial and inter-year measurements of losses of melt water and coefficients of run-off for the period of the spring floodwaters, discovered on the basis of the quantitative dependences of these phenomena on the moistening of the soil in the spring, the amount of ice, and the depth of freezing of the soil in the winter, the reserves of water in the snow, the dynamics of the spring snow-melt, and the run-off of melt water.

The third group of papers dealt with the inter-related problems of the formation and dynamics of the snow blanket, glaciers, and permafrost.

In a paper titled "General Tasks of Hydrological Research within the Framework of the Given Problem," G. A. Avsyuk (Institute of Geography, Acad. Sci. USSR) emphasized that the dynamics of glaciers constitute a summary index of very gradual changes in those natural processes which are determined by the water and heat regime of the earth's surface. A study of glaciers is of special importance for the solution of such problems as the theory of physical geography, the reciprocal effects of glaciation and climate, the role of glaciers in the moisture turnover, and the relief-forming activity of glaciers. Such a study should provide a scientific basis for the practice of construction in high-altitude and polar regions, and for the artificial regulation of the glacial feeding of rivers. At the present time the chief task is to study, by modern geophysical methods, the processes taking place in glaciers, for which the observations made as per the program of the International Geophysical Year should serve as a basis.

The paper read by G. D. Rikhter (Institute of Geography, Acad. Sci. USSR), "Tasks of Studying the Snow and Snow Blanket with the Framework of the Given Problem," gave a general survey of the state of research on the snow blanket and its role in the national economy, and also notes the tasks for further research. Data from many years of observations of the snow covering are inadequate both in terms of the program and in terms of being representative of the great diversity of conditions in the region covered by each station. In order to solve practical problems of water-heat melioration and to combat snow drifts and avalanches, it is necessary to study the structure and distribution of the snow on the basis of the conditions of its accumulation and movement.

V. N. Bogoslovskiy (Institute of Permafrost Study, Acad. Sci. USSR), in a paper titled "The Thermophysical Laws of the Formation of Strata of Frozen Rock and the Utilization of Those Laws for Practical Purposes," described two trends in research on heat- and mass-exchange within the atmosphere-lithosphere for geocriological [geokriologicheskiiye] purposes: 1) study of the laws governing the slow processes of the formation of strata of frozen rock, using the methods of physico-chemical analysis; studying the radioactivity of organic residues; palaeobotanical analysis; etc.; 2) a study of the same processes with a view to controlling the heat and moisture regime for national economic ends, based chiefly on the experimental and theoretical investigation of the heat flow

in the lithosphere. For purposes of using data on the heat balance of the earth's surface it is necessary considerably to increase their accuracy, since the values for the currents of heat lie within the limits of possible mistakes in present-day data.

The fourth group of papers was devoted to problems of the genesis of climate and its connection with the heat and water regime of the earth's surface.

In the paper read by A. P. Gal'tsov (Institute of Geography, Acad. Sci. USSR), "The State and Tasks of Research on the Genesis of Climate within the Framework of the Given Problem," methods of studying the processes of climate formation were subdivided into three basic groups. The method of the typification of atmospheric processes and finding their weather characteristics (typification of the baric field, classification of air masses and weather conditions) is important in predicting the weather, but owing to the failure to take into account the local peculiarities in the heat and water regime of the earth's surface, it has so far yielded statistical results that are too vague. The most promising method is that of the mathematical computation and reconstruction of the distribution of the elements of the climate; but at the present time it must be combined with the search for empirical and quasi-empirical relationships between phenomena (especially in studying the genesis of precipitation).

The paper read by M. Ye. Shvets (GGO), "The Present State of Climate Theory," was devoted to a survey of the results obtained by means of applying mathematical methods to problems of studying the formation of the mechanism of the general circulation of the atmosphere and the distribution of certain elements of the climate. It was noted that success in the use of these methods depends upon the correct combination of the laws of probability theory with the laws of thermodynamics and the correct choice of permissible simplifications. Among the results achieved in this area are maps of average monthly vertical velocities for the field of pressure, and maps of the average meridional circulation of the atmosphere, together with the theory of the stationary zonal distribution of temperature in the atmosphere, utilizing equations for the heat balance of the earth's surface as limiting conditions. A priority task for further research is a study of the genesis of large-scale disturbances in circulation and the stability of currents of circulation and the effect of orography.

In a paper titled "The Moisture Turnover in the Atmosphere," O. A. Drozdov (GGO) discussed the present state

of the problem and cited several new data on the relationships between descriptions of precipitation and descriptions of the moisture content of the atmosphere. He gave an evaluation of the role of evaporation on land, and the role of mountain systems in the formation of precipitation. The maps of the mean monthly moisture content in the atmosphere which have been prepared for the Northern Hemisphere, have made it possible to ascertain the considerable effect of vertical movements and horizontal shifts from the oceans to the land mass on the moisture content of the atmosphere.

In a paper with the title "The Heat Balance and the Microclimate," M. P. Timofeyev (GGO) discussed the general conditions of the formation of the microclimate under the influence of changes in the components of the heat balance of the earth's surface, and reported on the results of studying the quantitative laws of the formation of the microclimate above bodies of water and irrigated fields.

The fifth group of papers was devoted to problems associated with the special aim of the coordinated study of the given problem: the analysis of the role of the heat and water regime of the earth's surface in the formation of the natural environment.

In his paper, "The Role of Heat Exchange and Moisture Exchange in the Structure and Development of the Geographic Covering (Primarily in the Plains of the Temperate Zone) and Their Significance for the Productivity of Agricultural Crops," Academician A. A. Grigor'yev cited computations of the magnitudes of various components of the heat balance of the earth's surface for each of the belts in the Temperate and Tropical zones, and compared them with available data on the productivity of the natural vegetative covering and with the latest physiological data on optimum conditions of the heat and water regime of cultivate plants in the belts of the Temperate Zone. This comparison accordingly showed that the commensurability of heat and moisture plays an important role in the productivity of the vegetational covering, and that the belts of deciduous forests and forest-and-steppe areas possess optimum conditions of the heat and water regime for the development of vegetation.

Academician I. P. Gerasimov, in a paper titled "Hydrothermal Factors in Soil Formation," surveyed the development of the problem of hydrothermal factors in the processes of soil formation. The temperature and water regime of soil formation have long been an object of study in soil science. Considerable data have now been accumulated. However, they are very heterogeneous, and existing general theories are in conflict. I. P. Gerasimov studied

the relationships between the distribution of genetic soil types and indexes of hydrothermal conditions, for which he used total temperatures for the active surrade above ten degrees, and M. I. Budyko's dryness index. The points indicating the soil types on the correlation graph for these two indexes were distributed within the limits of clearly limited belts corresponding to the hydrothermal conditions of the distribution of one type of soil or another. The preciseness of the result, which had not been achieved previously, is associated with the improved character of the energy indexes used, and the greater accuracy of the new comprehensive soil maps. The speaker emphasized, however, that the ratio obtained does not reveal the essence of the physical connection between the phenomena, and should serve only as the first stage in studying similar patterns.

The paper read by B. R. Volobuyev (Acad. Sci. AzSSR), "Total Expenditures of Energy on Soil Formation in Association with Hydrothermal Conditions," gave the results of the first investigation of the energetics of soil formation. It was established that the ratio between expenditures of energy on total evaporation, cyclic biological processes in the soil, and the disintegration of minerals therein was 100: : 1 : 0.01. Expenditures of energy on soil formation are governed by the relationship $Q=aR$, where R is the radiation balance, and a is the coefficient of efficiency for radiation energy in soil formation, increasing from dry to moist conditions. A ratio was likewise obtained between expenditures of energy on soil formation and the radiation balance, relative humidity, and the biological activity of the biocoenosis.

D. L. Armand (Institute of Geography, Acad. Sci. USSR) read a paper titled "The Importance of Balance Methods in the Study of Erosion," in which he discussed the given problem and gave a general description of the means of studying this phenomenon. A quantitative study of erosion requires, in addition to the water balance, employment of the balance method for the solid substances of the lithosphere. The problem is one of ascertaining those portions of potential energy of precipitation falling on elevations which are transformed into the kinetic energy of the run-off expended on erosion, and on dissipation in streams. The theoretical aspect of the problem can be dealt with on the basis of existing theories; but in order to obtain the magnitudes of the parameters under various combinations of natural conditions, laboratory and field experiments are required.

The paper read by F. F. Davitaya (GUGMS /Main Administration of the Hydrometeorological Service of the USSR/) showed that despite the large volume of agroclimatic research, further study of the resources of heat and moisture is of great scientific and practical importance for agriculture. One of the most important problems is the rational zonal distribution of vegetables, fruits, and berries of differing maturation so as to ensure fresh products throughout the greater part of the year. Taking into account the distribution of heat and moisture can yield a tremendous practical effect in combatting drought and in working out a rational distribution of meliorative and agrotechnical measures.

In a paper with the title, "The Role of Heat and Moisture in the Ecology and Distribution of Animals," A. N. Formozov pointed out the complexity and peculiarities of reactions of various groups of animals to these basic conditions in the environment. The character of the regulation of the body temperature of an animal, the size of its body, and the nature of the covering is of great importance in this connection. Animals have the capacity of actively seeking out areas with a favorable microclimate. Therefore, heat and moisture determine the redistribution of animals within one region to a larger extent than they do their distribution over large territories. This fact was illustrated using the example of the distribution of the malaria mosquito, the tsetse fly, etc.

Discussions were held after each group of papers, and were reflected in the resolution of the conference. It was noted that the methods of study and the data on the heat balance obtained by the GGO were widely used in all aspects of the general problem, and special emphasis was given to the self-sacrificing work of Academician A. A. Grigor'yev, who is continuing his purposive theoretical attack on the most complex synthetic aspect of the given problem.

At the same time the conference found there was inadequate contact in the study of various aspects of the general problem, and proposed stepping up the coordination of research, including that done within the framework of individual aspects. The most important goals of this coordination include the accumulation of data on the heat and water balance, agreement on methods of the geographic generalization of data from experimental observations, and the organization of comprehensive experimental projects covering all aspects of the given problem. The conference resolved to publish a collection of its studies with a view to using it as material for the Third All-Union Geographic Congress, the Twelfth

General Assembly of the International Union of Geophysicists and Geodesists, and the Nineteenth International Geographic Congress.

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